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NASA EESS Wideband Briefing

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OUTLINE

- WHO IS NTIA?

- EESS

- METSAT BANDS (INFO)

- PASSIVE & ACTIVE (INFO)

- 8025-8400 MHZ

- 25.5-27 GHZ

CHECKS & BALANCES SPECTRUM MANAGEMENT PROCESS

COMMUNICATIONS ACT OF 1934

FY2002

Approp: \$14.054m

Reimbursable: \$22.055m

Total: \$36.109m

FY2002

Approp: \$29.788m

Fees: \$218.757m

Total: \$248.545m

NTIA

(On behalf of President)

- National Defense
- Law Enforcement & Security
- Transportation
- Resource Mgt Control
- Emergencies
- Other Services

FCC

- Business
- State & Local
- Entertainment
- Commercial
- Private

COORDINATION

ADVISORY

LIAISON

INTERDEPARTMENT RADIO ADVISORY COMMITTEE (IRAC)

20 Govt Departments/Agencies as Members

NTIA Chairs IRAC & Subcommittees

WHO IS NTIA?

NTIA serves as the principal adviser to the President on telecommunications policies as they pertain to the Nation's technological and economic advancement.

NTIA is the primary Executive Branch agency responsible for developing and articulating domestic and international telecommunications policies.

NTIA also manages use of the radio frequency spectrum by all federal agencies.

<http://www.ntia.doc.gov/>

EARTH EXPLORATION- SATELLITE SERVICE (EESS)

- *Earth exploration-satellite service: A radiocommunication service between earth stations and one or more space stations, which may include links between space stations, in which:*
 - information relating to the characteristics of the Earth and its natural phenomena, including data relating to the state of the environment, is obtained from *active sensors* or *passive sensors* on Earth *satellites*;
 - similar information is collected from airborne or Earth-based platforms;
 - such information may be distributed to earth stations within the system concerned;
 - platform interrogation may be included.
- This service may also include *feeder links* necessary for its operation.

METEOROLOGICAL-SATELLITE SERVICE

- *An earth exploration-satellite service* for meteorological purposes.

SAMPLE BANDS OF METSAT ALLOCATIONS

- 137-138 MHZ
- 401-403 MHZ
- 460-470 MHZ
- 1670-1710 MHZ
- 2025-2110 MHZ
- 2200-2290 MHZ
- 7750-7850 MHZ
- 18100-18300 MHZ

EESS (PASSIVE AND ACTIVE)

- active sensor: A measuring instrument in the earth exploration-satellite service or in the space research service by means of which information is obtained by transmission and reception of radio waves.
- passive sensor: A measuring instrument in the earth exploration-satellite service or in the space research service by means of which information is obtained by reception of radio waves of natural origin.

EESS
8025-8400 MHZ
25500-27000 MHZ

TWO EESS BANDS OF
MAJOR INTEREST FOR
WIDEBAND SPACE-TO-
EARTH COMMUNICATIONS

8025-8400 MHZ

8025-8400 MHz				
International Table			United States Table	
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government
8025-8175 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.463			8025-8175 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) Mobile-satellite (Earth-to-space) (no airborne transmissions)	8025-8175
5.462A			US258 G117	US258
8175-8215 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) MOBILE 5.463			8175-8215 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) Mobile-satellite (Earth-to-space) (no airborne transmissions)	8175-8215
5.462A			US258 G104 G117	
8215-8400 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.463			8215-8400 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) Mobile-satellite (Earth-to-space) (no airborne transmissions)	8215-8400
5.462A			US258 G117	US258

5.462A In Regions 1 and 3 (except for Japan), in the band 8025-8400 MHz, the earth exploration-satellite service using geostationary satellites shall not produce a power flux-density in excess of the following provisional values for angles of arrival (θ), without the consent of the affected administration:

–174 dB(W/m²) in a 4 kHz band for $0 \leq \theta < 5^\circ$

–174 + 0.5 ($\theta - 5$) dB(W/m²) in a 4 kHz band for $5 \leq \theta < 25^\circ$

–164 dB(W/m²) in a 4 kHz band for $25 \leq \theta \leq 90^\circ$

These values are subject to study under Resolution 124 (WRC-97)*.

* Note by the Secretariat: This Resolution was revised by WRC-2000.

US258--In the band 8025-8400 MHz, the non-Government earth exploration-satellite service (space-to-Earth) is allocated on a primary basis. Authorizations are subject to a case-by-case electromagnetic compatibility analysis.

G117--In the bands 7.25-7.75 GHz, 7.9-8.4 GHz, 17.8-21.2 GHz, 30-31 GHz, 33-36 GHz, 39.5-40.5 GHz, 43.5-45.5 GHz, and 50.4-51.4 GHz, the Government fixed-satellite and mobile-satellite services are limited to military systems.

PFD LIMITS AT 8025-8400 MHZ

AT SURFACE OF THE EARTH ; TABLE 21-4 (WRC-2000)

Frequency band	Service*	Limit in dB(W/m ²) for angle of arrival (δ) above the horizontal plane			Reference bandwidth
		0°-5°	5°-25°	25°-90°	
8 025-8 500 MHz	Earth exploration-satellite (space-to-Earth) Space research (space-to-Earth)	−150	$-150 + 0.5(\delta - 5)$	−140	4 kHz

22.5 § 4 In the frequency band 8 025-8 400 MHz, which the Earth exploration-satellite service using non-geostationary satellites shares with the fixed-satellite service (Earth-to-space) or the meteorological-satellite service (Earth-to-space), the maximum power flux-density produced at the geostationary-satellite orbit by any Earth exploration-satellite service space station shall not exceed -174 dB(W/m²) in any 4 kHz band.

SHARING SCENARIOS WITH EESS, 8025-8400 MHZ

EESS SPACE STATION-TO-TERRESTRIAL: PFD

NGSO EESS SPACE STATION-TO-FSS/MSS/METSAT GSO SPACE STATION: PFD

GSO EESS SPACE STATION-TO-FSS/MSS/METSAT/EESS GSO SPACE STATION: FCOOR¹

NGSO EESS SPACE STATION-TO-FSS/MSS/METSAT NGSO SPACE STATION: ICOOR²

EESS NETWORK-TO-EESS NETWORK: ICOOR² (EXCEPT GSO-TO-GSO)

TERRESTRIAL-TO-EESS EARTH STATION: FCOOR¹

FSS/MSS/METSAT EARTH STATION-TO-EESS EARTH STATION: FCOOR¹

EESS SPACE STATION-TO-SRS (8400-8450 MHZ; DEEP SPACE): ICOOR²

¹ - FCOOR = FORMAL COORDINATION

² – ICOOR = INFORMAL COORDINATION

25.5 – 27 GHz

NTIA MANUAL; 22.5-27.5 GHz					
International Table			United States Table		Remarks
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
25.25-25.5 FIXED INTER-SATELLITE S5.536 MOBILE Standard frequency and time signal-satellite (Earth-to-space)			25.25-25.5 FIXED INTER-SATELLITE S5.536 MOBILE Standard frequency and time signal-satellite (Earth-to-space)	25.25-27 Standard frequency and time signal-satellite (Earth-to-space) Earth exploration-satellite (space-to-space)	Note: In this manual a primary allocation has been added for the inter-satellite service in the bands 25.25-25.5, 25.5.-27 and 27-27.5 GHz. The footnote S5.536 changes the direction indicator for the earth-exploration satellite service allocation in the 25.5-27 GHz band from space-to-space to space-to-Earth. At this time, the FCC has not adopted these changes.
25.5-27 EARTH EXPLORATION-SATELLITE (space-to-Earth) S5.536A S5.536B FIXED INTER-SATELLITE S5.536 MOBILE Standard frequency and time signal-satellite (Earth-to-space)			25.5-27 FIXED INTER-SATELLITE S5.536 MOBILE Earth exploration-satellite (space-to-Earth) Standard frequency and time signal-satellite (Earth-to- space)		
27-27.5 FIXED INTER-SATELLITE S5.536 MOBILE	27-27.5 FIXED FIXED-SATELLITE (Earth-to-space) INTER-SATELLITE S5.536 S5.537 MOBILE		27-27.5 FIXED INTER-SATELLITE S5.536 MOBILE	27-27.5 Earth exploration-satellite (space-to-space)	

5.536 Use of the 25.25-27.5 GHz band by the inter-satellite service is limited to space research and Earth exploration-satellite applications, and also transmissions of data originating from industrial and medical activities in space.

5.536A Administrations installing Earth exploration-satellite service earth stations cannot claim protection from stations in the fixed and mobile services operated by neighbouring administrations. In addition, earth stations operating in the Earth exploration-satellite service should take into account Recommendation ITU-R SA.1278.

5.536B In Germany, Saudi Arabia, Austria, Belgium, Brazil, Bulgaria, China, Korea (Rep. of), Denmark, Egypt, United Arab Emirates, Spain, Estonia, Finland, France, Hungary, India, Iran (Islamic Republic of), Ireland, Israel, Italy, Jordan, Kenya, Kuwait, Lebanon, Libya, Liechtenstein, Lithuania, Moldova, Norway, Oman, Uganda, Pakistan, the Philippines, Poland, Portugal, Syria, Slovakia, the Czech Rep., Romania, the United Kingdom, Singapore, Sweden, Switzerland, Tanzania, Turkey, Viet Nam and Zimbabwe, earth stations operating in the Earth exploration-satellite service in the band 25.5-27 GHz shall not claim protection from, or constrain the use and deployment of, stations of the fixed and mobile services.

PFD LIMITS AT 25.5-27 GHZ

AT SURFACE OF THE EARTH

TABLE 21-4 (WRC-2000)

Frequency band	Service*	Limit in dB(W/m ²) for angle of arrival (δ) above the horizontal plane			Reference bandwidth
		0°-5°	5°-25°	25°-90°	
19.3-19.7 GHz 22.55-23.55 GHz 24.45-24.75 GHz 25.25-27.5 GHz	Fixed-satellite (space-to-Earth) Earth exploration- satellite (space-to- Earth) Inter-satellite	-115	$-115 + 0.5(\delta - 5)$	-105	1 MHz

NOTICE OF PROPOSED RULE MAKING: In the Matter of Amendment of Parts 2, 25, and 87 of the Commission's Rules to Implement Decisions from World Radiocommunication Conferences Concerning Frequency Bands Between 28 MHz and 36 GHz and to Otherwise Update the Rules in this Frequency Range & Amendment of Parts 2 and 25 of the Commission's Rules to Allocate Spectrum For Government and Non-Government Use in the Radionavigation-Satellite Service (FCC 02-261; RELEASED OCTOBER 7, 2002)

NPRM; FCC 02-261 22.5-27.5 GHz					
International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
25.5-27			25.5-27	25.5-27	
EARTH EXPLORATION-SATELLITE (space-to-Earth) 5.536A 5.536B			EARTH EXPLORATION-SATELLITE (space-to-	Earth exploration-satellite	
FIXED			SATELLITE (space-to-	(space-to-Earth) 5.536A	
INTER-SATELLITE 5.536			Earth) 5.536A	Standard frequency and	
MOBILE			FIXED	time signal-satellite	
Standard frequency and time signal-satellite (Earth-to-space)			INTER-SATELLITE 5.536	(Earth-to-space)	
			MOBILE		
			Standard frequency and		
			time signal-satellite		
			(Earth-to-space)		

SHARING SCENARIOS WITH EESS, 25500-27000 MHZ

EESS SPACE STATION-TO-TERRESTRIAL: PFD

GSO EESS NETWORK-TO-EESS/ISS GSO NETWORK: FCOOR¹

NGSO EESS NETWORK-TO-EESS/ISS GSO/NGSO NETWORK: IFOR²

TERRESTRIAL-TO-EESS EARTH STATION: FCOOR¹

¹ - FCOOR = FORMAL COORDINATION

² – ICOOR = INFORMAL COORDINATION

EMC ISSUES:

EESS SHOULD:

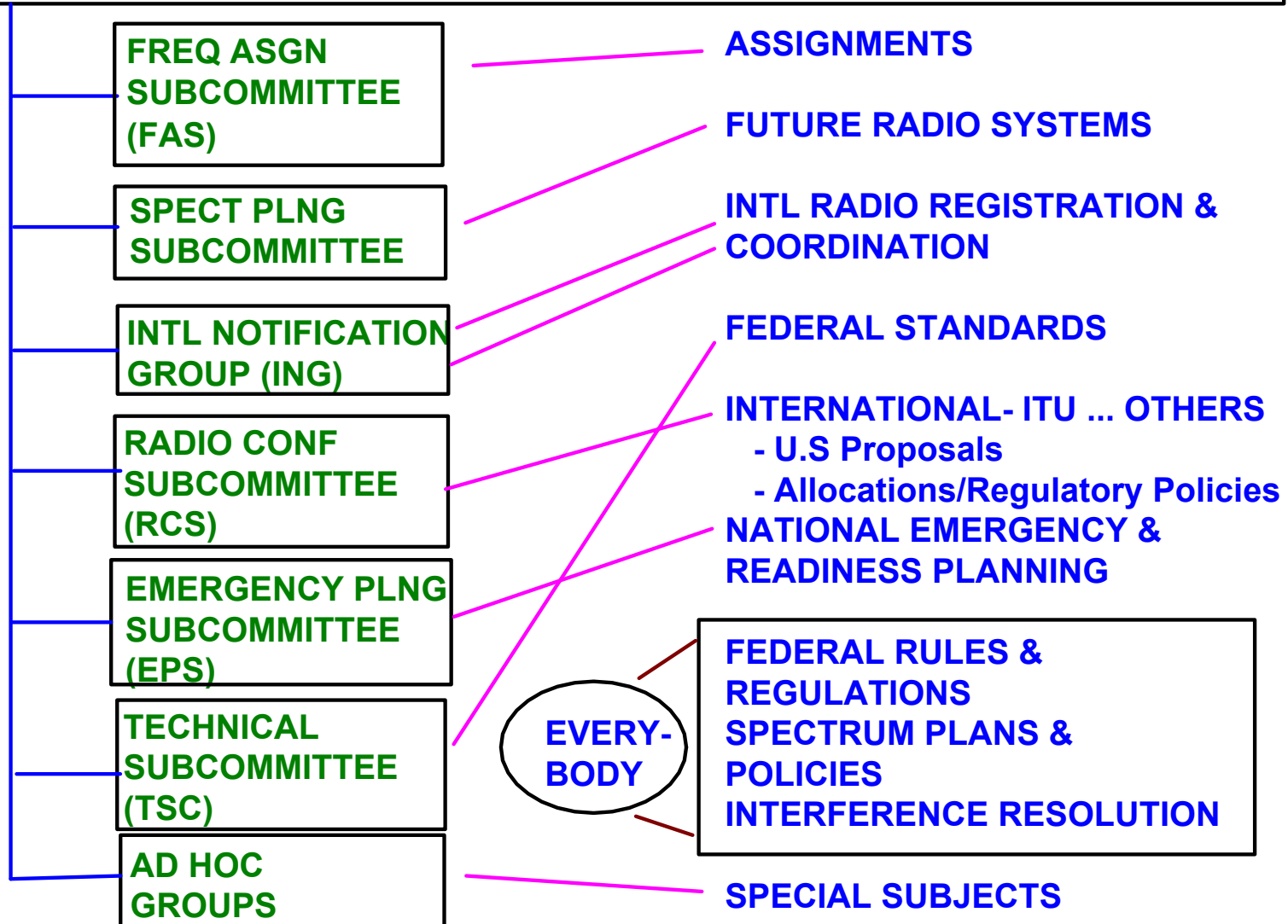
1. MEET ALL PFD LIMITS
2. BEST ANTENNA PRACTICES, E.G., LARGER THE BETTER
3. MINIMIZE BANDWIDTH
4. OUT-OF-BAND FILTERING
5. MINIMUM NUMBER OF EARTH STATIONS
6. EARTH STATION LOCATION SELECTION
7. COORDINATE
8. REALIZE WHO YOU ARE SHARING THE BAND WITH
AND THEIR REQUIREMENTS

CONCLUSIONS

- START EARLY
- MAKE SURE YOU KNOW THE REGULATIONS AND RULES EARLY
- CONTACT THE NECESSARY PEOPLE

BACKUP SLIDES

INTERDEPARTMENT RADIO ADVISORY COMMITTEE (IRAC)



GOVERNMENT OR NON- GOVERNMENT?

Excerpt from COMMUNICATIONS ACT OF 1934 (entire Act can be found at:
'<http://www.fcc.gov/Reports/1934new.pdf>'):

SEC. 305. [47 U.S.C. 305] GOVERNMENT-OWNED STATIONS.

(a) Radio stations belonging to and operated by the United States shall not be subject to the provisions of sections 301 and 303 of this Act. All such Government stations shall use such frequencies as shall be assigned to each or to each class by the President. All such stations, except stations on board naval and other Government vessels while at sea or beyond the limits of the continental United States, when transmitting any radio communication or signal other than a communication or signal relating to Government business, shall conform to such rules and regulations designed to prevent interference with other radio stations and the rights of others as the Commission may prescribe.

(b) All stations owned and operated by the United States, except mobile stations of the Army of the United States, and all other stations on land and sea, shall have special call letters designated by the Commission.

(c) The provisions of sections 301 and 303 of this Act notwithstanding, the President may, provided he determines it to be consistent with and in the interest of national security, authorize a foreign government, under such terms and conditions as he may prescribe, to construct and operate at the seat of government of the United States a low-power radio station in the fixed service at or near the site of the embassy or legation of such foreign government for transmission of its messages to points outside the United States, but only (1) where he determines that the authorization would be consistent with the national interest of the United States and (2) where such foreign government has provided reciprocal privileges to the United States to construct and operate radio stations within territories subject to its jurisdiction. Foreign government stations authorized pursuant to the provisions of this subsection shall conform to such rules and regulations as the President may prescribe. The authorization of such stations, and the renewal, modification, suspension, revocation, or other termination of such authority shall be in accordance with such procedures as may be established by the President and shall not be subject to the other provisions of this Act or of the Administrative Procedure Act.

EXCERPT FROM NTIA MANUAL

8.2.17 Determining Whether a Station is a Government Station

1. The following guidelines are to assist in the determination of whether or not a station belongs to and is operated by the United States as specified in Section 305(a) of the Communications Act of 1934 :

a. The department or agency concerned should be able to exercise effective control over the radio equipment and its operation; and

b. The department or agency concerned assumes responsibility for contractor compliance with Executive Branch, departmental, or agency instructions and limitations regarding use of the equipment and ensures that such instructions and limitations are met when operating under the authority of an Executive Branch frequency authorization to the department or agency; and

c. The station should be operated by an employee of the department or agency or by a person who operates under the control of the department or agency on a contractual or cooperative agreement basis, and who is under supervision of the department or agency sufficient to ensure that Executive Branch, departmental, or agency instructions and limitations are met.

2. It is recognized that a Government agency may make a contract arrangement for maintenance or operation of a radio station under its control without diminishing the effective control of, or responsibility for, such station, provided the appropriate limitations or requirements are specified.

3. Since the foregoing may not cover every case, or where there may be doubt, the determination will be made by the department or agency concerned after consultation with the NTIA/ FCC as appropriate.

TT&C

TT&C

(WHAT HAS BEEN DONE IN THE USA)

E.G.,

- 401-403 MHZ
- 2025-2110 MHZ
- IN BAND: 8025-8400 MHZ OR 26 GHZ

IN US&P GOV ONLY

- 2200-2290 MHZ



THE SECRETARY OF DEFENSE

WASHINGTON, DC 20301-1000

CS EXECUTIVE SECRETARIAT

1999 AUG -4 PM 1:06
AUG 2 1999

Honorable William M. Daley
Secretary of Commerce
Washington, D. C. 20230

Dear Bill,

On April 15, 1985, the Department of Defense (DoD) indicated to the Department of Commerce that use of the frequency band 2200-2290 MHz by commercial entities would be detrimental to national security interests. This band was and is still used for critical national security programs. Without proper regulation and control, simultaneous Government and commercial operations in the band could jeopardize the effectiveness of these programs.

DoD has completed a review of its policy regarding use of this frequency band. To facilitate private sector involvement in space, DoD will permit commercial space launch use of this band on a case-by-case basis consistent with U.S. Government usage and national security concerns. DoD will work with the other federal agencies to ensure any use is consistent with national interests including foreign policy goals and arms control considerations.

The 2200-2290 MHz band must remain Government exclusive with non-Government use on a non-interference basis. The National Telecommunications and Information Administration (NTIA) should retain full regulatory control of this band to ensure continued protection of national security interests. Commercial space launch use of the band must be conducted on an exception basis to the U.S. Table of Frequency Allocations.

This revised DoD spectrum policy allows commercial space launch use of Government allocated spectrum on an exception basis. It will remain in effect until identification of suitable alternative commercial space launch spectrum and further development/operation of commercial spaceports.

Sincerely,

EXCERPT FROM
RADIO REGULATIONS - ARTICLE 9
PROCEDURE FOR EFFECTING COORDINATION WITH OR
OBTAINING AGREEMENT OF OTHER ADMINISTRATIONS

9.7 *a)* for a station in a satellite network using the geosta-tionary-satellite orbit, in any space radiocommunication service, in a frequency band and in a Region where this service is not subject to a plan, in respect of any other satellite network using that orbit, in any space radiocommunication service in a frequency band and in a Region where this service is not subject to a plan, with the exception of coordination between earth stations operating in the opposite direction of transmission.

9.17 *l)* for any specific earth station or typical mobile earth station in frequency bands above 100 MHz allocated with equal rights to space and terrestrial services, in respect of terrestrial stations, where the coordination area of the earth station includes the territory of another country, with the exception of the coordination under No. **9.15**; (WRC-2000)

9.17A *m)* for any specific earth station, in respect of other earth stations operating in the opposite direction of transmission, in frequency bands allocated with equal rights to space radiocommunication services in both directions of transmission and where the coordination area of the earth station includes the territory of another country or the earth station is located within the coordination area of another earth station, with the exception of the coordination under No. **9.19**; (WRC-2000)

9.18 *n)* for any transmitting station of a terrestrial service in the bands referred to in No. **9.17** within the coordination area of an earth station, in respect of this earth station, with the exception of the coordination under Nos. **9.16** and **9.19**; (WRC-2000)